

## REMARKS

In the present Office Action, dated March 28, 2006, claims 1-56 are pending in the Application. These same claims have been rejected. The Applicant addresses each of the issues raised by the Examiner in the order they appear in the Office Action.

As a preliminary matter, claim 30 was amended to correct antecedent basis inconsistency, by deleting the word "finite." Any other amendments to the claims are explained in more detail below.

### *Information Disclosure Statement*

The listing of references has been properly corrected by submitting a list in a separate paper.

### *Specification*

In the future, the Applicant will correct any errors in the specification of which the Applicant becomes aware. Presently, the Applicant has changed several reference numbers in the specification to make these reference numbers consistent with the Drawings. Also, several typographical mistakes were addressed. In either case, no new matter was added.

### *Drawings*

The Applicant has corrected the drawings per the Examiner's request. Specifically, In Fig. 2B, reference number 300 was changed to 206; 304 was changed to 212; 306 was changed to 214; and 302 was changed to 216. New Drawings have been submitted with this response. No new matter was added.

### *Claim Rejections – 35 U.S.C. § 112, ¶ 1*

Claims 8, 18, 36, and 44 have been rejected as failing to provide support for a limitation recited in the claims: "... after the data transaction commits." The Applicant points the Examiner to paragraphs [0065] - [0067], reproduced herein:

[0065] With respect to caching, Fig. 3B depicts another embodiment of information retrieval system 300. In a typical implementation, server 302 (which may comprise multiple computing devices) includes a B-link tree layer 310 generating log entries 314, a memory 335 and cache memory 330, which raises

the question of how to log the operations of the B-link tree layer 310, some of which may be present in cache memory 330 as an intermediate step, i.e., how to handle log entries 314 describing data transactions to be performed on data structure 306 in such a system. Described in more detail below, one way to handle logging is to utilize memory 335 to store log entries 314 that are not yet committed to persistent storage 304 while *utilizing cache memory 330 to store updated records of data structure 306 as an intermediate step before commission to persistent storage 304.*

[0066] Performance is improved in such a system because not all updates from the B-link tree layer 310 need go directly to persistent storage 304 as changes to data structure 306. Thus, as illustrated in Fig. 3B, if the operations are organized in transactions, *the log record updates corresponding to a transaction are written to the persistent storage 304 when the corresponding transaction commits. In the meantime, they can be cached in cache storage 330.*

[0004] Similarly, while a log entry 314 is generated for each operation by B-link layer 310, the log entry 314 does not need to be written to the persistent storage 304 immediately, and thus, a tail 312b of the log can be stored in memory 335 as an intermediate step....

(emphasis added). From the above, log record updates are written to persistent storage, from intermediate storage/memory, when the corresponding transaction commits. Put in other words, *when* the corresponding transaction commits, then *after* that the updates are written to memory (from the intermediate storage/memory) – hence, *in the meantime*, they can be cached. *Similarly*, while *a log entry* is generated for each operation by B-link layer, the log entry does not need to be written to the persistent storage immediately (but can be written later or *after* the fact), and thus a tail of the log can be stored in memory as an intermediate step.

### ***Claim Rejections – 35 U.S.C. § 101***

Claims 1-22, 24-46, and 48-55 have been rejected as directed to non-statutory subject matter. The Applicant telephoned the Examiner on May 19, 2006, seeking clarification as to the above mentioned rejection. Essentially, the Examiner contended that the scope of the preamble of the above mentioned claims was not commensurate to the scope of the elements recited in these claims.

The Applicant has addressed this concern by deleting the phrase “whereby a state of the data structure is recovered by re-performing data transactions represented by the logging”

from the preamble of each independent claim. Now, both the preamble and the elements of each independent claim refer to the concept of “logging.”

Moreover, claims 23, 47, and 56, which reference recovery of a data structure, are in proper form because they explicitly recite either a “further” aspect of the claimed subject matter (claim 23), or elaborate on previously recited subject matter (claims 47 and 56).

***Claim Rejections – 35 U.S.C. § 103***

Claims 1-21, 29-45, and 51-54 have been rejected as unpatentable over U.S. Patent No. 5,485,608 (Lomet et al.) in view of “Efficient Locking for Concurrent Operations on B-Trees” (Lehman et al.). Claims 22-23, 26-28, 46-47, 50, and 55-56 have been rejected as unpatentable over Lomet et al. in view of U.S. Patent No. 5,434,994 (Shaheen et al.). Lastly, claims 24, 25, and 48-49 have been rejected as unpatentable over Lomet et al. in view of Shaheen et al. and further in view of Lehman et al.

Applicant has amended the independent claims by incorporating limitations from the corresponding dependent claims (and added similar limitations, where no such corresponding claims existed – but where support exists in the specification). *See* the “Listing of Claims” above.

For example, claim 1 recites the following:

A method for logging while updating a B-link tree via a plurality of data transactions, comprising:

generating at least one log entry corresponding to a data transaction of the plurality of data transactions, the data transaction to be carried out on said B-link tree, wherein said at least one log entry includes at least one entry from an allocation layer and at least one entry from a B-link tree layer; and  
storing said at least one log entry into a log.

(amended language emphasized). Claim 1 incorporates limitations from dependent claim 3. Claims 3 recited “wherein said at least one log entry includes at least one of (A) at least one entry from an allocation layer and (B) at least one entry from a B-link tree layer.” Applicant has altered this limitation to include both (A) and (B). Support for this amendment can be directly found in the specification in paragraph [0077].

The Examiner has cited col. 19, ll. 35-37 of Lomet et al. and p. 657, sec. 3.3 of Lehman et al. as allegedly meeting this newly incorporated limitation from claim 3 (Office

Action, p. 7). Applicant respectfully disagrees. In short, the RLOG (redo log) and ULOG (undo log) do not correspond to an allocation layer and a B-link tree layer, respectively (or vice versa) – or alternatively, per claims 22, 46, and 55, an upper layer and an allocation layer. *See*, for example, paragraph [0079] of the Specification. Lehman also does not disclose such multiple layers in a log entry. Therefore, Applicant submits that the recited subject matter in claim 1 patentably defines over Lomet and Lehman, individually or in combination. Shaheen et al. has not been cited to address this limitation, and the Applicant submits that it also does not disclose it.

Applicant has amended the other independent claims in a similar fashion (or, alternatively, some of the independent claims already contained such limitations): “generating at least one log entry corresponding to a data transaction of the plurality of data transactions, the data transaction to be carried out on said B-link tree, wherein said at least one log entry includes at least one entry from an allocation layer and at least one entry from a B-link tree layer” (**claim 12**); “maintaining a single log, where the log is partitioned into an upper layer and an allocation layer, at each of said first and second server locations, wherein the single log includes log entries from both the upper layer and allocation layer” (**claim 22**); “an allocation layer object for said B-link tree; a B-link tree layer object, wherein said at least one log entry includes at least one entry from the allocation layer object and at least one entry from the B-link tree layer object” (**claim 29**); “an allocation layer and a B-link tree layer, wherein said at least one log entry includes at least one entry from the allocation layer and at least one entry from the B-link tree layer” (**claim 38**); “a storage element within which a single log is maintained, wherein the single log is partitioned into an upper layer and an allocation layer, at each of said first and second server locations, and wherein the single log includes log entries from both the upper layer and allocation layer” (**claim 46**); “means for generating at least one log entry corresponding to a data transaction of the plurality of data transactions, the data transaction to be carried out on said B-link tree, wherein said at least one log entry includes at least one entry from an allocation layer and at least one entry from a B-link tree layer” (**claim 51**); “means for generating at least one log entry corresponding to a data transaction of the plurality of data transactions, the data transaction to be carried out on said B-tree, wherein said at least one log entry includes at least one entry from an allocation layer and at least one entry from a B-link tree layer” (**claim 53**); and “means for maintaining

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**PATENT**

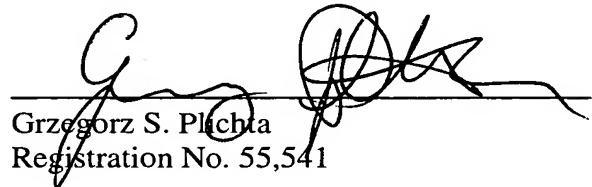
a single log, where the log is partitioned into an upper layer and an allocation layer, at each of said first and second server locations, wherein the single log includes log entries from both the upper layer and allocation layer” (**claim 55**).

In so far as the dependent claims incorporate limitations from the above discussed independent claims, they are allowable for similar reasons: claims 2 and 4-11 (depending from claim 1); claims 14-21 (depending from claim 12); claims 23-28 (depending from claim 22); claims 30, 32-37 (depending from claim 29); 40-45 (depending from claim 38); claims 47-50 (depending from claim 46); claim 52 (depending from claim 51); claim 54 (depending from claim 53); and claim 56 (depending from claim 55).

### **CONCLUSION**

Accordingly, Applicant submits that claims 1-2, 4-12, 14-30, 32-38, and 40-56, currently pending in the Application, patentably define over the cited art. Withdrawal of the rejection and allowability of the pending claims is thus earnestly solicited. Applicant believes that the present Response addresses each of the points raised by the Examiner in the Office Action, and that the aforementioned pending claims are in condition for allowance. Favorable consideration and passage to issue of the Application at the Examiner’s earliest convenience is earnestly solicited.

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